WATER RESOURCES SECTOR REPORT

Session Chair: Frank Quinn
Rapporteur: Michael Barlage

INTRODUCTION

The Water Resources breakout group included participants from various sectors of government, education, and industry from the United States and Canada. Many of the participants were experts in the field of Great Lakes research and policy making.

The breakout sessions were dedicated to answering the four questions that we were asked to address. Each session began with a brief fifteen minute introduction by the session chair. The remaining time consisted of a free forum discussion of the current question. Discussion continued until each member was given sufficient time to express his/her view on the issue being considered.

The discussion group was expected to interpret the four questions broadly in an effort to reduce the chance that significant issues would be overlooked. Because this was an initial effort, failing to include potentially critical issues was considered a greater mistake than including issues that, upon further study, turn out to be relatively unimportant. The participants were not asked to make quantitative assessments of the impacts that they discussed.

It was clear during the breakout sessions that although the group was answering different questions in each session, the four questions were intertwined and each question was addressed to some degree in each session.

SIGNIFICANT FINDINGS

The Great Lakes region contains a vast, valuable resource of fresh water. Climate change is expected to increase the value of this resource. In a more arid environment, fresh water will be at a demand not only by inhabitants of the region, but also by an increasing populace outside the region. Excessive agricultural by-products may cause extreme deterioration of water quality in the region. Water levels in the future are predicted to be highly fluctuant. Hydrologic users have no precedent to this situation and coping strategies must be developed to deal with these issues.

THE 4 QUESTIONS ADDRESSED

1. What are the current concerns? & 2. How may climate change impact our lives?

The group found it difficult to separate their responses to questions 1 and 2. The stresses listed below therefore reflect a combined response.

Based on the fact that ertain General Circulation Models (GCMs) predict a six to nine foot drop in water levels for the Great Lakes. A drop of this extent will increase the need to regulate water usage and diversion limits. In addition, models predict future climate scenarios with highly fluctuant water levels and some produce hotter, drier climates. Some predictions are dramatic. During the discussion, the group listed the types of impacts that these predicted changes would cause if they really occurred. The list is not organized strictly by priority. For a priority analysis please see the Concerns Matrix at the end of this document. The following is a list of current and future concerns facing the hydrologic resources of the Great Lakes region.

- ***Failure to prepare.*** The group expressed concern about a failure to prepare for the extreme events that will be expected to occur at a higher frequency in the future climate.

- ***Lack of Education.*** Individuals are not receiving proper, accurate information regarding how climate change and variability will affect

their lives. This lack of correct information stems from an inability to communicate concerns, precautions, or possible outcomes of climate change at the local level.

• ***Public trust.*** Extreme events in the future may overrun current regulatory efforts, which may effect a loss of public trust in these regulatory measures.

• ***Property owners.*** If lake levels become highly fluctuant, (as models predict), then there is concern about aggravating lake shore property owners.

• ***Slow response.*** There is concern that the regulation response time will not be fast enough to react to the rapidly changing lake levels. Lake levels can change significantly on sub-year time scales. New regulations can take several years to implement.

• ***Lake Superior.*** Due to the shallow outflow region of Lake Superior, it is possible during extreme low water events that Lake Superior could become a terminal lake.

• ***Shore erosion.*** Land owners and environmentalists will be increasingly concerned about shore erosion on the Great Lakes, particularly Lake Michigan.

• ***Wetlands.*** Under low water scenarios, wetlands will decrease in area or individually disappear. These wetlands serve as homes for many native and migratory species.

• ***Water quality.*** Inland waters are expected to decrease in quality. This decrease will occur due to runoff of agricultural pesticides and fertilizers, the use of which is expected to increase in the future. These fertilizers will also promote algae growth, further decreasing water quality.

• ***Water rights.*** Many climate change scenarios suggest that many regions in the U.S. will experience drier summers. In a more arid future climate, the Great Lakes will become an increasingly important commodity because they contain approximately 95% of the fresh water supply in the United States. Entitlement of this water is not firmly established and may be a future concern.

• ***Better GCMs.*** Current predictions of global climate change are done using sophisticated computer models. However, these models do not include the Great Lakes in their simulations. The Great Lakes affect the regional climate extensively. To completely understand regional climate change, models which include the Great Lakes will have to be run.

• ***Competition.*** A decrease in water levels will increase the legal conflicts which arise due to competition for the available fresh water.

• ***Irrigation.*** Many climate change scenarios suggest drier summers. The agricultural sector may therefore need more water for irrigation. This will put an even larger stress on the existing water resources.

• ***Lake water quality.*** Inland lake water, which is used for both consumption and recreation, will decrease in quality under an increased agricultural production scenario.

• ***Turn over.*** Some computer simulations suggest that climate change may decrease the biannual over turning of the Great Lakes, which is vital to maintaining sufficient oxygen concentration.

• ***Ice cover.*** A warmer future climate scenario will lead to less ice cover. This can have both positive and negative effects. Shipping may increase, shore storm erosion may increase, and loss of winter recreation revenues on northern lakes may occur. Fish reproduction may either increase or decrease.

In summary, the major finding from this breakout session is that past experiences with our water resources will not be a key to future success in a new highly fluctuating climate.

3. What additional information do we need?

The major issue for this breakout session was the need for an improved GCMs. In order to understand and evaluate changes in future climate, model accuracy must be increased. There is an immediate need for the inclusion of regional scale models to evaluate the Great Lakes effects on regional climate predictions. The ultimate goal is to get temporal and spatial resolutions at the watershed level to fully access the impacts of global climate change on an individual lake basis.

• ***Better observational network.*** The current network is inadequate. There is also a fear of losing this observational network altogether because of funding cutbacks. This loss would be detrimental to the supply of information that is needed to verify current climate fluctuations.

• ***Socioeconomic data.*** There is a need for socioeconomic data on a watershed basis. The impacts of climate change on water resources will occur within watersheds but socioeconomic data is collected by political jurisdiction. This produces a mismatch that inhibits data analysis and usefulness.

• ***More groundwater information.*** Currently, there is very little groundwater information available. Groundwater is a very important variable in climate and watershed models.

• ***More information on extreme events.*** The extreme events that are expected under climate change are not well documented. More information on these extremes and possible solutions for encountering them are needed.

4. How do we cope with climate change?

The identification of climate change mitigation strategies was undertaken with the previous breakout discussions in view. In discussing various coping mechanisms and mitigating strategies, the group focused on two categories: communication and development.

Communication Issues

• ***Inclusion.*** There is a need to get nontraditional players involved in the regulatory process. Examples of these nontraditional players include riparian land owners, environmentalists, and agricultural irrigators.

• ***Increased scale.*** Communication generally occurs on a watershed basis. Future discussions need to be undertaken at the regional or interwatershed level.

• ***Methods.*** The methods of communication need to be improved to help in the visualization of solutions and information to hydrologic users. Current modes of communication do not facilitate the relation to available information.

• ***Credibility.*** It is difficult to get current water managers to listen to existing information. The prevalence of false or misleading information is undermining the validity of climate change discussions. There is a need to enhance the accuracy of information being given (to water managers).

• ***Education.*** There is a general need for education about the possible solutions at all levels, especially the general population, adults, and K-12 students. The education must include accurate information regarding what climate change means and how it will affect future existence.

Development Issues

• ***Models and simulations.*** There is a need to develop mechanisms to deal with the trade-offs that will occur during climate change. Accurate lake management models need to be developed to help local and state managers better estimate future strategies to deal with extreme lake levels. Simulation games need to be developed so that managers, riparians, and other players know how the regulation of lake levels will affect various users of water resources.

• ***Impact analysis.*** There is a need to update impact analysis for decision making. Managers are currently using risk management practices that were developed in the 1960s. With an increase in extreme events that is predicted in the future, these management practices will be useless. Solutions for coping with climate change need to be robust enough to deal with the extreme events.

	GREAT LAKES	INLAND LAKES	WETLANDS	RIVERS & STREAMS
Hydropower	Moderate	Low	High	Low
Navigation	High	Low	Low	Low
Industrial Water Supply	Moderate	Low	Moderate	Moderate
Municipal Water Supply	High	Low	High	High
Effluent Discharges	Low	Low	High	Low
Beaches	Moderate	Moderate	Low	Low
Recreational Boating	High	Moderate	Moderate	Low
Ice Fishing	Moderate	Moderate	Low	Low
Sport Fishing	Moderate	Moderate	High	Low
Riparians	High	High	High	Low
Infrastructure	Moderate	Moderate	Moderate	Moderate
Irrigation	Moderate	Moderate	Moderate	High
Flood Control	Moderate	Moderate	High	Low
Drought Mitigation	Moderate	Low	High	Moderate
Ecological Concerns	High	High	High	Low

Low Concern Moderate Concern High Concern